



**FELLOWSHIP SUMMARY REPORT**

Dr. RENE FREIBERG

Directorate: TAD/CRP

Theme 1: Managing Natural Capital for the Future

Contract: JA00095216

**Photochemical mapping of European and North American lakes: assessing the self-purification ability of freshwater resources**

Host institution: University of Turin (UNITO), Italy, Department of Chemistry, Dr. Davide Vione, Associate Professor

Dates of the fellowship: 02 October- 27 November 2017 & 04 March- 01 April 2018

I agree that this report will be published on the OECD Co-operative Research Programme's website

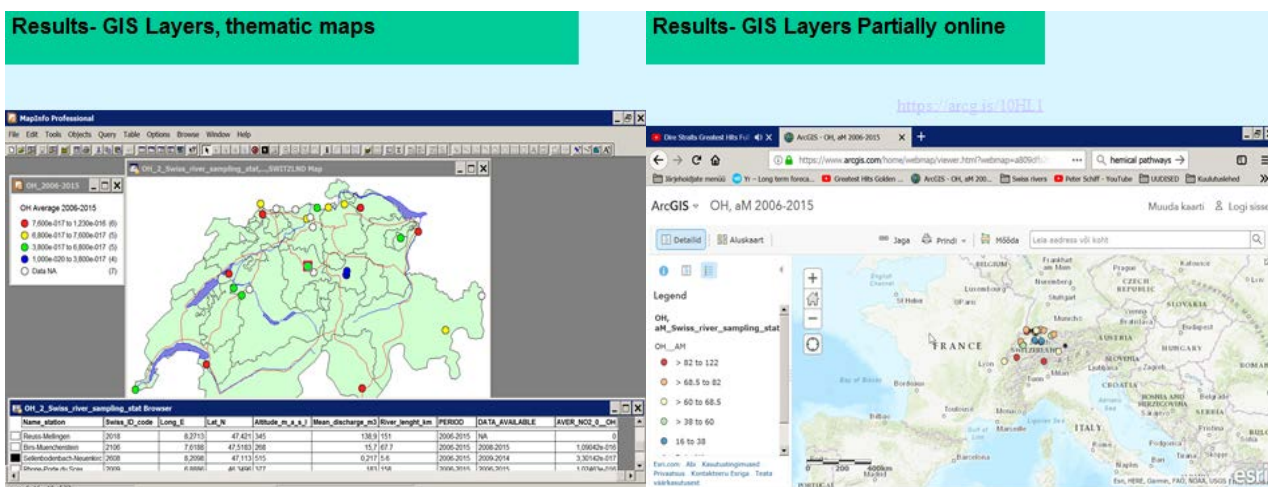
## 1. What were the objectives of the research project? Why is the research project important?

Agriculture is a major user of water and has huge impact on water quality and ecosystems. The availability of unpolluted freshwater resources is a growing concern worldwide and sound knowledge base is needed for sustainable agri-environmental policy making. Photochemical reactions are major abiotic processes for the transformation of bio-recalcitrant pollutants. Xenobiotics (e.g. agricultural chemicals, industrial wastes and emerging pollutants, such as pharmaceuticals and personal care products) can be degraded in sunlit surface waters by direct and indirect photochemistry. The relevant pathways are dependent on water chemistry and depth, which can be strongly influenced by human activities and climate change. Deep understanding of these processes is needed to assess human impact and climate trends to the availability of unpolluted freshwater resources in the near future.

PHOTODEPUR project did take the challenge to map the photochemical properties of European water bodies, and by using specially developed software tool, to calculate the steady state concentrations of photoactive compounds in the water column.

## 2. Were the objectives of the fellowship achieved?

As the project was funded only partially and continues in March 2018, the work is still going on. We have been able to make data analyses and modelling of about 200 monitoring stations/sampling points on the rivers of North-Italy and Switzerland. In March we expect to include more monitoring data. We have been working out the concept how to present geographical information and to visualize the results of the project in MapInfo and on-line ArcGIS applications (see fig. below). We have also started to prepare the publication of the research results in scientific journals.



## 3. What were the major achievements of the fellowship? (up to three)

1. Good collaboration established with the host institution, preparation of further co-operational projects (Marie Curie post-doc application)
2. Combination of the expertise of the fellow and the host institution- hydrobiology/GIS systems and photochemical modelling
3. New knowledge about the photochemical self-purification ability of surface waters, long term trends caused by human impact & climate change.

## 4. Will there be any follow-up work?



Publication of the project results is envisaged in scientific journals, we start with the manuscript in March 2018. We have prepared Marie-Curie post-doc application to further finance the project and are keeping eyes open for other possibilities to elaborate our collaboration. At the moment all results of the project will be public but in the future there can be applications developed that can lead to protected intellectual property and novel software products.

**5. How might the results of your research project be important for helping develop regional, national or international agro-food, fisheries or forestry policies and, or practices, or be beneficial for society?**

Publicly available on-line thematic maps will easily pinpoint these areas and water bodies that have the weakest photochemical potential for self-purification and therefore are most vulnerable to agricultural and/or industrial pollution. Project will develop new approach that will provide direct benefits to the international scientific community and to provide relevant information and evidence based advice that will aid future policy decisions related to the sustainable use and management of freshwater resources. Beneficiaries are both, public authorities and private consulting companies that have to assess the environmental impact of economic activities.

**6. How was this research relevant to:**

- The objectives of the CRP?
- The CRP research theme?

This project did promote international scientific collaboration and transfer of knowledge between the workgroups in Italy and Estonia, addressing the common challenge of the sustainable management of freshwater resources for agriculture.

This project perfectly fitted within the frame of the “Managing Natural Capital for the Future” theme, with its central focus on the sustainable use of the freshwater resources along the agri-food chain.

PHOTODEPUR project did strengthen scientific knowledge of the photochemical self-purification ability of freshwater water bodies in Europe. This GIS database will open new perspectives in the scientific community for timeline and geographical trend analysis of the photochemical properties of freshwater resources. Outcomes of the project will assist many stakeholders- from local environmental agencies to international organizations- to make evidence based decisions and work out agri-environmental policies. Publicly available on-line thematic maps will easily pinpoint these areas and surface water resources that have the weakest photochemical potential for self-purification and therefore are the most vulnerable to agricultural and/or industrial pollution.

**7. Satisfaction**

The fellowship helped me to establish first direct contacts with the host institution; it was simple and clear way to fund this collaboration. As such the fellowship completely fulfilled my expectations. I expect that this co-operation will continue as we plan to apply for an additional funding (Marie Curie, H2020 etc.) and my career as a researcher can continue with broad international collaboration.

I didn't encounter any notable practical problems and as so I do not have suggestions to make any improvements in the Fellowship Programme.

**8. Advertising the Co-operative Research Programme**

I did hear about the CRP from my colleague and then visited the webpage of the programme. My opinion is, that this opportunity is visible enough for those who are seeking to finance short term co-operation.

Please keep the financing/reporting clear & simple and thank you for the support!

